REMARKS

Claims 1-3 and 6-28 are pending in the present application and are rejected. Claims 3, 7 and 12 are herein amended.

Priority

Upon review of the Office Action, Applicants note that the Office Action has not indicated that the priority documents have been received. Applicants respectfully request that the Examiner indicate this in the next Office Action.

Applicants' Response to Claim Rejections under 35 U.S.C. §102

Claims 1-3, 6, 27 and 28 were rejected under 35 U.S.C. §102(b) as being anticipated by Ishihara (JP 10-318733).

It is the position of the Office Action that Ishihara discloses the invention as claimed. Ishihara is directed at optical equipment in which light travels from a light source 1 to a sample *A* via a pinhole 2, collimate lens 4, beam splitter 5, microlens array 6, pinhole array section 7, liquid crystal cell 20 and objective lens 8. It is noted that the objective lens 8 contains a quarter phase contrast plate. Light then travels from sample *A* to photosensor 15 via objective lens 8, liquid crystal cell 20, pinhole array section 7, microlens array 6, beam splitter 5 and formation lens 12. The liquid crystal cell 20 is illustrated in detail in Figures 2(a), 2(b), 3 and 4.

In response to Applicants' previously filed remarks, the Office Action states that "[t]here is nothing in the Ishihara reference that would lead the examiner to believe only a portion of the

liquid crystal cells are controllable." Accordingly, the Office Action interprets the liquid crystal cells of Ishihara to be the same as those in the pending invention.

In response, Applicants herein clarify the differences between the liquid crystal matrix of the present invention and the liquid crystal cell 20 of Ishihara. In particular, Applicants note that the claimed invention requires "a control part including a liquid crystal control subpart to control each pixel of said matrix type liquid crystal device." In other words, as illustrated in Figure 3, all of pixels *a* and *b* are controllable.

On the other hand, in Ishihara, a matrix type liquid crystal device is illustrated in plan view in Figure 2(b). The device is patterned into a hounds-tooth pattern, including shaded portions which are a transparent electrode pattern 201 and non-shaded portions which are portions without the transparent electrode pattern. Formed within both the transparent electrode pattern 201 and portions without the transparent electrode pattern are a plurality of pinholes (black dots).

The liquid crystal cell 20 used by Ishihara differs in structure from the liquid crystal matrix of the present invention. The structure of Ishihara's liquid crystal cell 20 is explained in paragraphs [0015] to [0020] and Figures 2 and 3 of Ishihara. For the convenience of the Examiner, Applicants herewith attach a partial human-translation of Ishihara, which improves upon the machine-translation provided by the Office.

The liquid crystal cell 20 of Ishihara is installed under a microlens array section 6 and a pinhole array section 7. There is a transparent electrode (ITO film) 201 under the pinhole array

section 7. A liquid crystal 204 is further enclosed between the transparent electrodes 202 of the transparent electrode substrate 203.

The transparent electrode 201 has the shape of a hound's-tooth check-like configuration. As shown in Figure 2(b), one pinhole of the pinhole array section 7 corresponds to one section of a grid, and voltage is always applied between transparent electrodes 201 and 202 by power source 21. A transparent electrode 202 is a common electrode without a pattern. Voltage is not applied to the liquid crystal molecules in the part without the pattern of transparent electrodes 201 and 202. Thus, each one pattern is formed for each one grid of the pattern of the transparent electrode 201, as shown in Figure 2(b). On the other hand, in the liquid crystal matrix of the present invention, all pixels are controlled. Thus, Applicants respectfully submit that the liquid crystal matrix of the present invention distinguishes over that of Ishihara.

Additionally, with respect to the light being passed through a quarter phase plate, the Office Action states that "[t]here are no limitations in the claim about what happens to the light after passing through the liquid crystal cells." However, this is inaccurate, since, for example, claim 1 recites that "said liquid crystal control subpart controls polarization directions of the lights transmitted through each neighboring pixel of the matrix type liquid crystal device so that they are made mutually orthogonal." Regardless, it appears that the Office Action interprets Ishihara to anticipate this claim limitation. In particular, the Office Action cites paragraph [0018], which states that "[s]ince the pattern of a transparent electrode 201 is a hound's-tooth check-like, it will have the plane of polarization plane of polarization and the illumination light injected from an adjacent pinhole cross at right angles mutually."

In response, Applicants respectfully submit that the liquid crystal cell 20 used by Ishihara differs from the liquid crystal matrix of the present invention from polarization control. Paragraph [0017] of Ishihara. The liquid crystal molecules of liquid crystal 204 are TN liquid crystals in the torsion array by 90 degrees between transparent electrodes 201 and 202.

Since voltage is not applied to the liquid crystal molecules in the part without the pattern of transparent electrodes 201 and 202, if the linearly polarized light which is polarized in the direction of a major axis of the liquid crystal molecule carries out incidence, output light will turn into the linearly polarized light in which the plane of polarization carried out the rotatory polarization by 90 degrees by the rotatory polarization effect of the torsion array.

On the other hand, since torsion structure is cancelled in the liquid crystal part on which the voltage is applied by transparent electrodes 201 and 202, and liquid crystal molecules have no torsion between electrodes, the rotatory polarization will not occur at all, but the light will be passed in the state of polarization as it is.

Therefore, the illumination light which turned into the linearly polarized light by the optical-path branching optical element 5 passes through the corresponding pinhole of the pinhole array section 7 where it is condensed by each microlens of the microlens array section 6, and it carries out incidence on a liquid crystal cell 20.

The illumination light incident on the liquid crystal cell 20 is changed so that it may become linearly polarized light the polarized planes of which are different by 90 degrees, corresponding to whether there is a transparent electrode within a liquid crystal cell 20. Since the pattern of a transparent electrode 201 is a hound's-tooth check-like pattern, the illumination light

injected from an adjacent pinhole will have mutually orthogonal planes of polarization. See Ishihara, paragraph [0018]. On the other hand, in the liquid crystal matrix of the present invention, the polarized light is controlled by each liquid crystal. That is, each liquid crystal of the matrix is controlled.

With respect to claim 3, Applicants previously submitted that it was improper to construe microlens array 6 as a first and second microlens, and improper to construe liquid crystal device 20 as a first and second liquid crystal device. However, the Office Action maintains that this position is valid. Accordingly, in order to clarify the claimed structure, Applicants herein amend claim 3 in order to recite that the first and second microlens are separate, and that the first and second liquid crystal devices are separate.

Accordingly, Applicants respectfully submit that, in addition to the reasons discussed above, claim 3 distinguishes over Ishihara since it recites two separate microlens arrays and liquid crystal devices. On the other hand, Ishihara only discloses a single microlens array and a single liquid crystal device. Favorable reconsideration is respectfully requested.

Applicants' Response to Claim Rejections under 35 U.S.C. §103

Claims 7-18, 22 and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ishihara in view of Hoffman (U.S. Patent Application Publication No. 2001/0042837).

With regard to claims 7-18, it is the position of the Office Action that Ishihara discloses the invention as claimed, with the exception of amplitude modulation. The Office Action relies

on Hoffman to provide this teaching. Specifically, the Office Action points to paragraphs [0021] and [0038] to provide this teaching.

With regard to claims 7 and 12, Applicants respectfully submit that these claims are patentable for similar reasons as claims 1 and 3, discussed above. Similar to claim 3 above, Applicants herein amend claim 12 in order to recite that the "first microlens array" and "first liquid crystal device" are separate from the "second microlens array" or a "second liquid crystal device," respectively. Accordingly, Applicants respectfully submit that, in addition to the reasons discussed above, claim 12 distinguishes over the combination of Ishihara and Hoffman, since it recites two separate microlens arrays and liquid crystal devices. On the other hand, the combination of Ishihara and Hoffman only discloses a single microlens array and a single liquid crystal device.

Additionally, in response to Applicants' previously filed remarks that the combination of Ishihara and Hoffman does not disclose a single light source, but rather discloses two light sources, the Office Action states that the claims are open-ended, and nothing in the claim requires that only a single light source is used. Accordingly, Applicants herein amend claims 7 and 12 to recite that the illuminating light source is the only light source. Thus, Applicants respectfully submit that, in addition to the reasons discussed above, claims 7 and 12 distinguish over the combination of Ishihara and Hoffman, since the combination of Ishihara and Hoffman includes two separate light sources. Favorable reconsideration is respectfully requested.

Claims 19-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ishihara in view of Hoffman and Oshida (JP 2001-108684).

It is the position of the Office Action that the combination of Ishihara and Hoffman discloses the invention as claimed, with the exception of reference to a fluorescent marker or DNA material. The Office Action relies on Oshida to provide this teaching. In response, Applicants respectfully submit that these claims are patentable due to their dependency on the independent claims, which Applicants submit are patentable for at least the reasons discussed above. Favorable reconsideration is respectfully requested.

Claims 24-26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Ishihara in view of Oshida.

It is the position of the Office Action that Ishihara discloses the invention as claimed, with the exception of reference to a fluorescent marker or DNA material. The Office Action relies on Oshida to provide this teaching. In response, Applicants respectfully submit that these claims are patentable due to their dependency on the independent claims, which Applicants submit are patentable for at least the reasons discussed above. Favorable reconsideration is respectfully requested.

For at least the foregoing reasons, the claimed invention distinguishes over the cited art and defines patentable subject matter. Favorable reconsideration is earnestly solicited.

Should the Examiner deem that any further action by applicants would be desirable to place the application in condition for allowance, the Examiner is encouraged to telephone applicants' undersigned attorney.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

Ryan B. Chirnomas
Attorney for Applicants
Registration No. 56,527
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

RBC/nrp
Enclosure: Partial Translation of JP 10-318733 (Ishihara)

Translation from Paragraph [0009] to [0031]

[0009]
[Means for Solving the Problem] Two-dimensional array type confocal optical equipment is constituted so that it may have an illumination-light change means to change the plane of polarization of the illumination light so that it may have the plane of polarization to which the illumination light injected from the pinhole adjoining the two-dimensional array type confocal optical equipment which has the pinhole array section like the conventional techniques A and B for the object achievement crosses orthogonally mutually, and the selective light-analysis means which carries out selective transmission of the reflected light from a body so that the plane of polarization may cross orthogonally mutually between the adjoining pinholes.

[0010] Said illumination-light change means is constituted with the linearly polarized light means which has the linearly polarized light as the illumination light, and a liquid crystal cell with the transparent electrode array of the array corresponding to each pinhole of the pinhole array section, and the selective light analysis means is constituted with a liquid crystal cell common to the liquid crystal cell of said illumination-light change means, and the light analysis means that transmits only the linearly polarized light of a certain direction.

[0011] Moreover, in the two-dimensional array type confocal optical equipment which has the micro-lens array as an objective lens like the conventional technique C, are provided an illumination-light change means to change the plane of polarization of the illumination light so that the illumination light injected from adjoining micro lenses may have the planes of polarization crossing mutually orthogonally, and the selective light-analysis means which carries out selective transmission of the reflected light from a body so that the plane of polarization may cross orthogonally mutually between the adjoining micro-lenses.

[0012] The above-mentioned illumination-light change means is constituted with the linearly polarized light means which has the linearly polarized light as the illumination light, and a liquid crystal cell with the

transparent electrode array of the array corresponding to each micro lens of a micro-lens array. Said selective light analysis means is constituted with the liquid crystal cell common to the liquid crystal cell of said illumination-light change means, and the light analysis means that transmits only the linearly polarized light of a certain direction.

[0013] Or both an illumination-light change means and a selective light analysis means are the same polarizing plate arrays, and said polarizing plate array is constituted so that it may have the structure where adjacent polarizing plates are mutually orthogonal Nicol.

[0014] Or both an illumination-light change means and a selective light analysis means are the same phase contrast plate arrays, and said phase contrast plate array is constituted so that adjacent phase contrast plates may have the phase contrast mutually different by 1 / 2 wavelength.

[0015]

[Embodiment of the Invention] Hereafter, the embodiment of this invention is explained with reference to drawings. The first example of the embodiment of this invention is shown in Fig. 1. The basic structure of the two-dimensional array type confocal imaging system of this example is the same as the conventional technique B. The overlapping explanation is avoided and only a different part is explained. Only the liquid crystal cell 20 installed under the pinhole array section 7 and the power source 21 that applies voltage to the liquid crystal cell 20 are different. The optical-path branching optical element 5 is a polarization beam splitter, and the liquid crystal cell 20 and the optical-path branching optical element 5 as a linearly polarized light means work as an illumination-light change means to the illumination light, and it commits a liquid crystal cell 20 and the optical-path branching optical element 5 as a light analysis means as a selective light analysis means to the reflected light from a body.

[0016] First, the structure is explained in full detail about a liquid crystal cell 20, and the motion as an illumination change means and a selective light analysis means is explained after that. The structure of a liquid crystal cell 20 is shown in Fig. 2. Fig. 2 (a) is a side view. A transparent electrode (ITO film) 201 is under the pinhole array section 7, and liquid

crystal 204 is further enclosed between the transparent electrodes 202 of the lower transparent electrode substrate 203. The transparent electrode 201 has a shape of a hound's-tooth check-like configuration, as shown in Fig. 2 (b), one pinhole of the pinhole array section 7 corresponds to one section of a grid, and voltage is always applied between transparent electrodes 201 and 202 by the power source 21. A transparent electrode 202 is a common electrode without a pattern.

[0017] The liquid crystal molecules of liquid crystal 204 are torsion pneumatic liquid crystal (it will be referred to as TN liquid crystal below) in the torsion array by 90 degrees between transparent electrodes 201 and 202. Since voltage is not applied to liquid crystal molecules in the part without the pattern of transparent electrodes 201 and 202, if the linearly polarized light which polarized in the direction of a major axis of a liquid crystal molecule carries out incidence, output light will turn into the linearly polarized light in which plane of polarization carried out the rotatory polarization by 90 degrees by the rotatory polarization effect of a torsion array. On the other hand, since torsion structure is canceled in the liquid crystal part on which the voltage is applied by transparent electrodes 201 and 202, and liquid crystal molecules have no torsion between electrodes, the rotatory polarization will not occur at all, but it will be passed in the state of polarization as it is.

[0018] The motion as an illumination change means by this liquid crystal cell 20 and the optical-path branching optical element 5 as a linearly polarized light means is described. The illumination light which turned into the linearly polarized light by the optical-path branching optical element 5 passes through the corresponding pinhole of the pinhole array section 7 where it is condensed by each micro lens of the micro-lens array section 6, and it carries out incidence to a liquid crystal cell 20. The illumination light injected from a liquid crystal cell 20 is changed so that it may become the linearly polarized light the 90 degree polarized planes of which are different, corresponding to whether there is a transparent electrode within a liquid crystal cell 20. Since the pattern of a transparent electrode 201 is a hound's-tooth check-like, the illumination light injected from an adjacent pinhole will have the mutually orthogonal

plane of polarization (however, the diagonal neighbor is not regarded as a neighbor.).

[0019] Next, the motion as a selective light analysis means by the liquid crystal cell 20 and the optical-path branching optical element 5 as a light analysis means is described. The illumination light which is injected from the liquid crystal cell 20 turns into the circular polarized light by 1 / 4 phase-contrast plate 10, and it is in the condition that plane of polarization changed by 90 degrees, after phase jumping by 180 degrees upon reflecting by Body A, and passing again the 1 / 4 phase-contrast plate 10. The reflected light incident to the liquid crystal cell 20 again passes through a pinhole in the state of polarization as it is in the part which does not have the pattern of a transparent electrode 201 within a liquid crystal cell 20, and it passes through a pinhole with the plane of polarization carrying out the rotatory polarization of it 90 degrees where there is a pattern. In any case, after passing through a pinhole, it becomes the plane of polarization orthogonal to the illumination light which turned into the linearly polarized light by the optical-path branching optical element 5, and after passing the micro lens array section 6, it is deflected by the optical-path branching optical element 5, and reaches to the two-dimensional photoelectrical sensor 15.

[0020] On the other hand, the beams which fades and incident to the next pinhole are considered (refer to Fig. 3). Since the reflected light before carrying out incidence to a pinhole (a liquid crystal cell 20 in more accurate sense) with the neighboring beams mutually orthogonal is in the polarization condition, the reflected light fading and incident to the next pinhole has the plane of polarization 90 degrees different from the light which carried out normal incidence. The plane of polarization of the reflected light different in the plane of polarization by 90 degrees injected to a optical-path branching optical element 5 from the incident pinhole is also different by 90 degrees from that of the normal incident light after all, and transmits the optical-path branching optical element 5 without deflecting by the optical-path branching optical element 5, and the two-dimensional photoelectrical sensor 15 is not reached.

[0021] By the above-described motion, there is no such a case that the

reflected light of the neighboring pinhole is mixing and lowering the confocal effect. Although there is of course a case that the fading light is mixed in from a diagonal neighbor or next of next neighbor, it is small when compared with the effect of the neighboring reflected light.

[0022] Although the conventional technique B was used as an example in this example, even if it is the conventional technique A, there is no big difference in principle. Prepare the above-mentioned liquid crystal cell 20 and two sets of a power source 21, and attach them in both the pinhole array section 7 by the side of lighting, and the detector pinhole array section 122 by the side of a detector. The polarizing plate that is a linearly polarized light means is prepared on the pinhole array section 7 by the side of lighting. What is necessary is just to set the polarizing plate which is a light analysis means by the arrangement of a parallel Nicol to the polarizing plate of a linearly polarized light means between the detector pinhole array section 122 by the side of a detector and the detector array 93, or between the liquid crystal cell 20 and the detector pinhole array section 122 by the side of a detector.

[0023] Moreover, in this example, in order to let the illumination light reflected on the micro-lens array section 6 surface not go to the direction of the two-dimensional photoelectrical sensor 15, such polarizing elements as the optical-path branching optical element 5 which is a polarization beam splitter and a 1 / 4 phase-contrast plate 10 are used, but since it is also possible to reduce reflection on the micro-lens array section 6 surface by coating or else, or to remove it by leaning the micro-lens array section 6, a polarizing element is unnecessary in this case. In such a case, the desired object can be attained only by preparing a polarizing plate between a liquid crystal cell 20 and the pinhole array section 7, as shown in Fig. 4. In this case, a non-polarization beam splitter suffices the optical-path branching optical element 5, and a 1 / 4 phase-contrast plate 10 is not necessary. The same can be realized in this way also to the equipment of JP 7-181023 A.

[0024] Neither the location of a liquid crystal cell 20 nor arrangement of a polarizing element necessarily needs to be as this example. For example, a liquid crystal cell 20 may be the same transparent electrode

arrangement as the micro-lens array section 6 on the micro-lens array section 6, with a liquid crystal cell sandwiched between two transparent electrode substrates, and may be arranged as an independent liquid crystal cell type. In addition, various arrangements can be considered to acquire the similar effect.

[0025] Moreover, although the liquid crystal in a liquid crystal cell 20 is designated as TN liquid crystal, since what is necessary is just to become the light which has the plane of polarization mutually orthogonal in the place which voltage is applied and in the place which not applied, when the illumination light of the linearly polarized light passes liquid crystal, the plane of polarization may be changed by 90 degrees by giving a phase contrast of 1 / 2 wavelength to an ordinary ray and an extraordinary ray, utilizing the electric-field control birefringence effect, besides utilizing the optical activity of liquid crystal like TN liquid crystal.

[0026] Moreover, although the pattern of a transparent electrode 201 is designated as a hound's-tooth check-like, it is not necessarily required to be a hound's-tooth check-like, since what is required is that beam deflection planes should be orthogonal at adjacent pinholes. For example in case of stripe, since the planes of polarization of the beam adjacent in at least one direction are mutually orthogonal, a certain effect can be acquired, if not as big effect as a hound's-tooth check. Moreover, also when the array of the micro-lens array section 6 is a hexagonal array, the pattern configuration must be fit to it.

[0027] Next, the second example of the embodiment of the present invention is shown in Fig. 5. The basic structure of the two-dimensional array type confocal imaging system of this example is same as the conventional technique C. In this case, although it is explained since there is no pinhole array section and hence it is not same as that of the first example, it is absolutely same as the first example as a fundamental principle. As shown in Fig. 5, a liquid crystal cell 20 is arranged under the micro-lens array 142 (it may be above as well). What is necessary is just to position so that 1 section of the grid pattern of a transparent electrode 201 may correspond to one micro lens of the micro-lens array 142. A polarizing plate 51 is arranged above a liquid crystal cell 20 to serve as

both a linearly polarized light means and a light analysis means. By this way, the same effect as the first example will be acquired. Naturally, a power source 21 is also required.

[0028] Next, the third example of the embodiment of the present invention is shown in Fig. 6. The basic structure of the two-dimensional array type confocal imaging system of this example is same as the conventional technique B. Different points from the first example are the point that the optical-path branching optical element 5 is a non-polarization beam splitter, and is the case where there is not a 1 / 4 phase-contrast plate, and an echo on the surface of the micro-lens array section 6 can be disregarded, and a point that the polarizing plate array 61 is installed under the pinhole array section 7 instead of a liquid crystal cell 20.

[0029] The polarizing plate array 61 is arranged in such a way that the polarizing plates in the polarization direction of a mutually orthogonal Nicol in the shape of a hound's-tooth check, as shown in Fig. 7. It is arranged so that each polarizing plate corresponds to each pinhole one by one. If the non-polarized illumination light (having at least an orthogonal 2-way polarization component) injects from the pinhole array section 7 and incidents to this polarizing plate array 61, the illumination light injected from the polarizing plate array 61 will turn into a linearly polarized light according to the direction of each polarizing plate of the polarizing plate arrays 61. The illumination light injected from the polarizing plate array 61 as a result will have the polarization direction where adjacent beams are mutually orthogonal.

[0030] The polarizing plate array 61 works also as a selective light analysis means so as to prevent the fading light from the reflecting neighboring beam from mixing. That is, since the polarization directions differ, even if the neighboring beam is mixed, it serves as a Nicol orthogonal to a polarizing plate and hence can not pass through a pinhole. Even if the two-dimensional array type confocal imaging system of the base is the conventional technique A, this example is, like the first example, also that in which two of the polarizing plate arrays 61 are prepared, and is absolutely the same case.

[0031] Next, the fourth example of the embodiment of the present invention is shown in Fig. 8. Although the basic structure of the two-dimensional array type confocal imaging system of this example is same as the conventional technique C, the difference from the second example is the point that the polarizing plate array 61 is installed under the micro-lens array 142 instead of the liquid crystal cell 20.

[0032] The polarizing plate array 61 is same as the third example, and the reflected light is prevented from mixing in the micro lens of the micro-lens array 142 which adjoins each other by the same principle as the third example.

[0033] Next, the fifth example of the embodiment of the present invention is shown in Fig. 9. The basic structure of the two-dimensional array type confocal imaging system of this example is same as the conventional technique B. Difference from the first example is a point that the phase contrast plate array 91 is installed under the pinhole array section 7 instead of the liquid crystal cell 20. Unlike the third example, the optical-path branching optical element 5 is a polarization beam splitter, and a 1 / 4 phase-contrast plate is also installed.

[0034] The phase contrast plate array 91 is arranged, as shown in Fig. 10, in such a way that a hole (phase contrast 0) and a 1 / 2 phase-contrast plate are arranged in the shape of a hound's-tooth check. It is arranged so that each of this section corresponds to each pinhole. If the light of the linearly polarized light which inclined 45 degrees to the direction of an optical axis of a 1 / 2 phase-contrast plate in the phase contrast plate array 91 is used as illumination light, the illumination light injected from the phase contrast plate array 91 does not change the polarization direction because phase contrast is 0 in the hole part, but changes the polarization direction by 90 degrees to the illumination light in the parts of a 1 / 2 phase-contrast plate. The illumination light injected from the phase contrast plate array 91 as a result will have the polarization direction where adjacent beams are mutually orthogonal.

[0035] Also as a selection light analysis means, the phase contrast plate array 91 worked to prevent the faded light from the next beam from mixing in. This principle is the same as the first example. Explanation is

made using Fig. 9. The beam different in the polarization direction by 90 degrees is injected from the phase-contrast plate array 91, irradiated on to Body A as circular polarized light by a 1 / 4 phase-contrast plate 10, a jump of a phase by 180 degrees occurs upon the reflection on Body A, each beam differs by 90 degrees in the polarization direction from the irradiated light after passing the 1 / 4 phase-contrast plate 10 again as the reflected light, passes as it is in the part of a hole when passing the phase-contrast plate array 91, changes the polarization direction by 90 degrees in the part of the 1 / 2 phase-contrast plate, resulting in both the light which passed the part of a hole and the light which passed 1 / 2 phase-contrast plate having the same polarization direction (but orthogonal to the illuminated light) , deflected by the optical-path branching optical element 5, and reaches after all the two-dimensional photoelectrical sensor 15. Since the deflection directions differ when the reflected light of the next beam carries out incidence to a pinhole, it is not deflected by the optical-path branching optical element 5, and the two-dimensional photoelectrical sensor 15 cannot be reached. Even if the two-dimensional array type confocal imaging system as the base is the conventional technique A, this example is also to prepare only two phase-contrast plate arrays 91, and is absolutely the same as the first example.

[0036] Next, the sixth example of the embodiment of the present invention is shown in Fig. 11. Although the basic structure of the two-dimensional array type confocal imaging system of this example is the same as the conventional technique C, the difference from the second example is the point that the phase-contrast plate array 91 is installed under the micro-lens array 142 instead of the liquid crystal cell 20.

[0037] The phase-contrast plate array 91 is the same as in the fifth example, and it is designed so that the reflected light does not mix in the micro lens of the micro-lens array 142 which adjoins each other by the same principle as the fifth example.

[0038] Although the phase-contrast plate array of the fifth and the sixth examples of the present invention is the array of the hole of phase contrast 0, and the phase-contrast plate of 1 / 2 wave of phase contrast, since there may just be 1 / 2 wavelength of difference among two kinds of

phase-contrast plates, the similar effect can be acquired also in the combination of, for example, the phase-contrast plates of one wavelength and 1 / 2 wavelength.

[0039]

[Effect of the Invention] The two-dimensional array type confocal optical equipment of the present invention prevents the fading light which is generated without exception from the adjoining pinhole from mixing by a multi-beam confocal, resulting in the improvement of the confocal effect. Or if the confocal effect is the same, then pinhole pitches can be made smaller.

[Brief Description of Drawings]

Fig. 1 illustrates the first example of the embodiment of the present invention.

Fig. 2(a) is a side view of a liquid crystal cell and its vicinity of the present invention, and (b) is to describe the transparent electrode pattern of the liquid crystal cell of the present invention.

Fig. 3 is to describe the mixing of the reflected light into an adjoining pinhole near the liquid crystal cell of the present invention.

Fig. 4 is a side view of a liquid crystal cell and its vicinity of the present invention.

Fig. 5 illustrates the second example of the embodiment of the present invention.

Fig. 6 illustrates the third example of the embodiment of the present invention.

Fig. 7 is to describe a polarized light plate array of the present invention.

Fig. 8 illustrates the fourth example of the embodiment of the present invention.

Fig. 9 illustrates the fifth example of the embodiment of the present invention.

Fig. 10 is to describe a phase contrast plate array of the present invention.

Fig. 11 illustrates the sixth example of the embodiment of the

present invention.

Fig. 12 is to describe the conventional technique A.

Fig. 13 is to describe the conventional technique B.

Fig. 14 is to describe the conventional technique C.

[Explanation of Marks and Symbols]

1	Light Source
2	Pinhole
4	Collimating Lens
5	Optical-Path Branching Optical Element
6	Micro Lens Array Section
7	Pinhole Array Section
8a	Lens
8b	Lens
9	Telecentric Aperture
10	1 / 4 Phase-Contrast Plate
12a	Lens
12b	Lens
15	Two-Dimensional Photoelectric Sensor
20	Liquid Crystal Cell
21	Power Source
61	Polarizing Plate Array
91	Phase-Contrast Plate Array